

Erector spinae plane block: Relatively new block on horizon with a wide spectrum of application - A case series

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ABSTRACT

Erector spinae plane (ESP) block is an interfascial plane block where a local anaesthetic is injected in a plane preferably below the erector spinae muscle. It is supposed to work at the origin of spinal nerves based on cadaveric and contrast study. It has emerged as an effective and safe analgesic regional technique. It has a wide variety of applications ranging from control of acute postoperative pain to chronic pain. In this series, we report a series of six cases, which include postoperative pain management in breast, thoracic, and abdominal surgeries along with management of two chronic pain cases to illustrate the potential uses of continuous and single-shot ESP block.

Key words: Analgesia, erector spinae block, regional

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INTRODUCTION

Erector spinae plane (ESP) block is one of the newer interfascial techniques with potential applications. ESP block is an interfascial block that can be performed by superficial or deep needle approach. In superficial needle approach technique, drug is injected between rhomboid major muscle and erector spinae muscle, whereas in the deep needle approach, drug is injected below erector spinae muscle [Figure 1]. It has been recommended to use the deep needle approach as drug is deposited closer to costotransverse foramina and origin of dorsal and ventral rami.^[1] It is supposed to work at the origin of spinal nerves, based on cadaveric and contrast studies.^[1,2] When dye was injected into the interfascial plane deep to erector spinae muscle bilaterally, craniocaudad spread of injectate from C7 to T8 on the right side and T1 to T8 on the left side was noticed in the paraspinous gutter with lateral spread till the transverse processes at all levels. The injectate was also noticed slightly beyond the costotransverse junctions at levels T3 to T6 on the right and T4 to T8 on the left.^[1] Cadaveric studies have

showed that block at T5 level is sufficient to have unilateral multidermatomal sensory block ranging from T1 to L3.^[3] This block serves the purpose of a paravertebral block without risk of pleural injury.^[4]

We have reported different subsets of cases to illustrate potential uses of either continuous or single-shot ESP block.

CASE REPORTS

Case 1

A 66-year-old male body mass index (BMI) 27.5 kg/m² was posted for right video-assisted thoracotomy surgery (VATS) and oesophagectomy. After induction

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of general anaesthesia, the patient was turned to prone position. Under all aseptic precautions and ultrasound guidance, bilateral ESP block was administered at T5 on the right side and T7 on the left side using a high-frequency linear ultrasound probe.

After identifying the level of the intervertebral space, the transverse process was traced laterally after identifying the spinous processes and lamina approximately 2.5–3 cm from midline in longitudinal position. The transverse process is identified as a hyperechoic curvilinear structure with pronounced finger-like acoustic shadowing beneath (trident sign) with lamina (sawtooth pattern) and spinous process medially and costochondral junction laterally.^[5] The transverse process has a square contour as compared to rib with rounded contour [Figure 2a and b]. Then the three muscles are identified from superficial to deep as trapezius, rhomboid major, and erector spinae with simmering pleura in between the transverse processes.

The block was administered by in-plane technique using 8 cm 16-G Tuohy’s needle inserted in cranial–caudad direction and the block needle was advanced through the trapezius, rhomboid major, and erector spinae to gently contact transverse process. Needle placement was confirmed by hydrodissection on injecting 2–3 ml of normal saline. On injecting 10 ml of 0.25% bupivacaine into interfascial plane deep to erector spinae, a visible linear pattern was visualized lifting the muscle [Figure 2c]. Then 10 ml of 0.25% bupivacaine was injected on both sides followed by insertion of a catheter deep to the erector spinae muscle.



Figure 1: Longitudinal view at transverse process. ST - subcutaneous tissue, 1 (TZ) - Trapezius, 2(RM) - Rhomboid Major, 3(ES) - Erector Spinae, 4 - Transverse process, [S] - Superficial needle approach, [D] - Deep needle approach

Under ultrasound guidance, 16-G catheter was inserted through Tuohy’s needle up to 3–4 cm beyond the needle tip [Figure 2d]. On the right side, the catheter was inserted cranially to cover thoracic dermatomes and on left side, it was introduced caudally to cover abdominal dermatomes. Both the catheters were fixed after subcutaneous tunneling and fixed with securing device.

General anaesthesia was administered. Injection morphine 6 mg intravenous (IV), injection paracetamol 1 g, and injection diclofenac 75 mg IV were given intraoperatively. Surgery lasted for 6 h.

Before extubation, infusion of 0.125% bupivacaine at 5 ml/h was started and residual neuromuscular blockade was reversed. The patient was stable and was shifted to surgical intensive care unit for further management. After 30 min of initiation of infusion, sensory blockade was checked. On the right side, it was from T1 to T7 and on the left side, it was from T4 to T12 [Figure 3]. Patient did not require postoperative mechanical ventilation. Postoperatively along with erector spinae infusion, intravenous injection paracetamol 1 g TDS and injection diclofenac 75 mg BD were continued. The infusion continued till 3 days, and the patient was pain free for 72 h with no opioid consumption.

Case 2

A 50-year-old female with BMI 33 kg/m² was posted for right modified radical mastectomy. She went

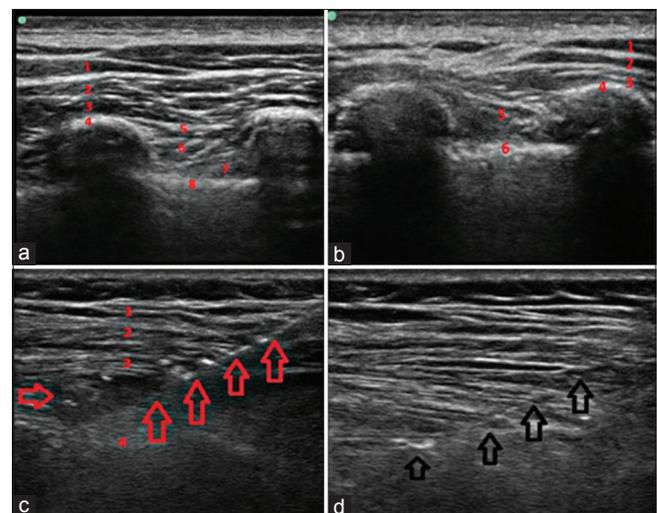


Figure 2: (a) Longitudinal view at transverse process 1 – trapezius, 2 – rhomboid major, 3- erector spinae, 4- transverse process, 5- external intercostal muscles, 6- internal intercostal muscle, 7 – paravertebral space, 8- pleura. (b) longitudinal view at ribs 1 – trapezius, 2 – rhomboid major, 3- erector spinae, 4- RIB, 5- intercostal muscles, 6 - pleura. (c) Linear visible pattern while lifting the muscle. (d) Epidural catheter insertion

on to receive general anaesthesia. After induction of anaesthesia, the patient was turned to the left lateral position. Under all aseptic conditions and ultrasound guidance, right-sided continuous ESP block was performed with 20 ml of 0.25% bupivacaine followed by catheter insertion at T5 level using a curvilinear probe [Figure 1]. Intraoperatively, injection paracetamol 1 g and injection diclofenac 75 mg was given intravenously. Erector spinae block infusion was started and the trachea was extubated after completion of surgery. After 30 min of initiation of postoperative infusion, sensory blockade was checked. It was from T2 to T8 [Figure 3]. Postoperatively along with infusion, injection paracetamol 1 g TDS and injection diclofenac BD were given intravenously. Patient was monitored for 72 h and was pain free with no opioid consumption. Similarly, other three patients received unilateral or bilateral continuous ESP block at T5 level for breast surgeries. They were also followed for 72 h with continuing infusion at 5 ml/h till catheter was removed and all patients were pain free. The sensory blockade ranged from T1 to T8.

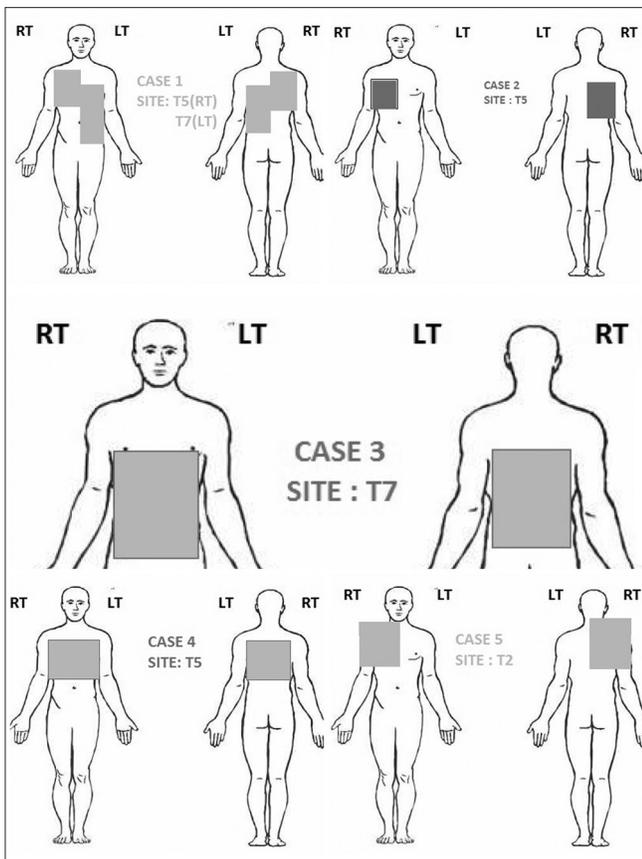


Figure 3: Dermatomes covered with different site used for erector spinae plane block in different cases

Case 3

A 63-year-old female with BMI 35 kg/m² was posted for abdominoplasty and ventral hernia with indistinct spinal anatomical landmarks. After induction of anaesthesia, the patient was given continuous bilateral ESP block at T7 level using 10 ml 0.25% bupivacaine on each side followed by catheter insertion in lateral position using high-frequency linear probe. Intraoperatively, injection paracetamol 1 g and injection diclofenac 75 mg were given intravenously. Before extubation, infusion 0.125% bupivacaine was started @ 5 ml/h. After extubation, the patient had visual analog scale (VAS) score 4 and 30 mcg fentanyl was given. After 30 min of initiation of ESP infusion, sensory blockade was checked. It was from T4 to L1 [Figure 3]. Postoperatively, ESP infusion continued for 3 days along with injection paracetamol 1 g TDS and injection diclofenac 75 mg BD intravenously. Patient was pain free with no more opioid consumption.

Case 4

A 68-year-old male with carcinoma lung and metastases to rib 4, 5, and 6 presented with extensive bilateral neuropathic pain in dermatome T4 to T6. The pain was poorly responsive to oral and topical pharmacotherapy. He was a postoperative case of laminectomy at same level. Under all aseptic conditions, using a curvilinear probe, T5 was identified in the lateral position and bilateral ESP block was given. ESP block was administered with 20 ml of 0.25% bupivacaine and 40 mg triamcinolone using a 23G spinal needle [Figure 4]. Patient had adequate pain relief after the block and had extensive sensory blockade from dermatome T2 to T8 [Figure 3]. VAS score was noted for 24 h. Patient was discharged

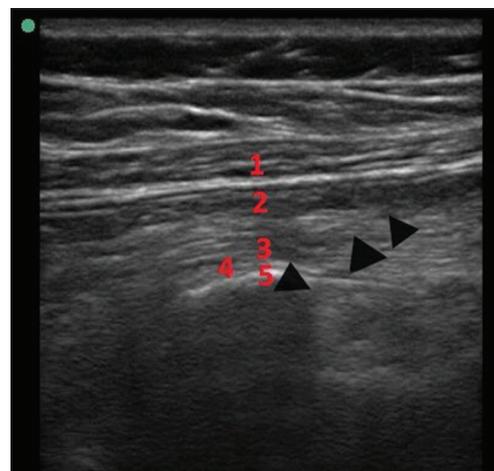


Figure 4: Longitudinal view at transverse process. 1- Trapezius , 2 - Rhomboid Major , 3 - Erector Spinae , 4 - drug (single arrow), 5 - Transverse process

Table 1: Case series of eight patients illustrating potential uses of ESP block with VAS postoperatively at different intervals

Pain	Surgeries	Level	Side	VAS	VAS	VAS	VAS	VAS 1 st	VAS	VAS 3 rd	Complication	
				15 min	30 min	1 h	6 h	day	2 nd day	day		
Acute postoperative pain	Breast surgeries	1.	T5	U/L	1	1	1	0	0	1	1	Nil
		2.	T5	U/L	2	1	0	0	0	0	1	Nil
		3.	T5	B/L	1	0	0	0	0	1	2	Nil
		4.	T5	B/L	1	1	0	0	0	0	0	Nil
	VATS + esophagectomy	5.	T5, T7	B/L	1	1	1	1	0	0	0	Nil
	Abdominoplasty and ventral hernia	6.	T7	B/L	4*	2	1	1	1	1	1	Nil
Chronic (neuropathic) pain	Thoracic	7.	T5	B/L	0	0	0	0	0	0	0	Nil
	Cervical	8.	T2	U/L	0	0	0	0	0	0	0	Nil

and was prescribed tablet tramadol 50 mg SOS. Patient was still pain free without consumption of any other oral analgesics at follow up after 4 months.

Case 5

A 62-year-old male with right metastatic cervical lymph nodes with metastases in the spine from an unknown primary carcinoma had severe cervical pain from C4 to T3. Therefore, using similar technique as in Case 4, right ESP block was given at T2 level in lateral position. Following administration of 20 ml of 0.25% bupivacaine and 40 mg triamcinolone, pain was relieved in few minutes with sensory blockade from C3 to T5 on right side [Figure 3]. VAS score was noted for 24 h. Patient was discharged and was prescribed tablet tramadol 50 mg SOS. Patient was still pain free without consumption of any other oral analgesics at follow up after 4 months.

The postoperative patients were followed for 72 h. VAS scores were noted at 15 min intervals for the first hour and then 2 hourly for 24 h, and 12 hourly for next 48 h. In all patients pain scores were <4 and rescue analgesia was required in one patient in the first hour of infusion. No other patient required rescue analgesia [Table 1]. In Case 4 and 5, patients with neuropathic pain were followed till 4 months and they were still pain free.

DISCUSSION

Epidural and paravertebral blocks have been commonly used for relieving acute or chronic pain for cervical, thoracic, or abdominal surgeries.^[6] Recently, many myofascial blocks and regional techniques have been introduced, including transversus abdominis plane block, rectus sheath block, and quadratus lumborum block for abdominal surgeries, pectoral nerve block for breast surgeries and intercostals, and interpleural

blocks for thoracic surgeries.^[7-9]

ESP block has emerged as an effective novel regional technique with effective analgesia with less opioid requirements, along with simplicity and safety.^[3,4] Our case series suggests that it can be used for selective multidermatomal sensory blockade according to surgery or site of pain. For sensory blockade of cervical, thoracic, and lumbar dermatomes, ESP block was administered at level T2, T5, and T7, respectively. While inserting the catheter for thoracic and abdominal surgeries, direction of epidural catheter was upwards and downwards, respectively. We used both curvilinear or linear transducer to administer ESP block depending on the depth of transverse process.

It has spectrum of potential applications ranging from acute postoperative pain to chronic neuropathic pain.^[1,3,4,10,11] It also has potential uses in condition where conventional therapies have limited role, such as in Cases 3 and 4, indistinct spine anatomical landmarks and laminectomy make epidural analgesia difficult. ESP block has easily recognizable sonoanatomy with easy insertion of dwelling catheter. There are no structures at risk of needle injury in immediate vicinity, making it comparatively simpler, safer with lesser expertise, and no procedural complications as compared to epidural and paravertebral blocks. It eliminates risk of hypotension of epidural analgesia, epidural spread and vascular puncture of paravertebral block, their procedural complications due to vicinity to spinal cord and pleura, respectively, as well as pneumothorax associated with intercostal nerve block and interpleural block.^[6] Its continuous nature, extensive cranio-caudal spread, no hindrance to surgical field, and only sensory blockade make ESP block superior to pectoral nerve blocks (single shot), TAP block (four quadrant blocks that required for the entire abdomen), rectus sheath, and quadratus lumborum blocks. Risk-benefit ratio of

recently used conventional regional techniques make their choice poor as compared to ESP block.

For thoracic surgeries or rib fractures, ESP block also helps for better lung expansion, superior analgesia, allows patient to cough, weaning off mechanical ventilation, and early ambulation, as showed by others.^[3,12] In addition, single-shot ESP block has also shown excellent results for relief of chronic (neuropathic) pain due to malignancy as illustrated by others.^[1]

Our findings are based on a small case series; therefore, we further suggest controlled studies to compare ESP block with conventional analgesic techniques for respective surgeries in terms of technical difficulty, efficacy, and patient comfort. Also, studies should be done on variability of sensory dermatomal block associated with injection at different level of transverse process, volume of injectate, direction of catheters, and duration of pain relief in chronic pain patients.

CONCLUSION

We conclude that ultrasound-guided ESP block is an excellent regional anaesthesia technique on the horizon. It has wide applications in pain relief ranging from postoperative acute pain in breast surgeries, thoracotomies, and abdominal surgeries to chronic neuropathic pain.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Forero M, Adhikary SD, Lopez H, Tsul C, Chin KJ. The erector spinae plane block: A novel analgesic technique in thoracic neuropathic pain. *Reg Anaesth Pain Med* 2016;41:621-7.
2. Chin KJ, Adhikary S, Sarwani N, Forero M. The analgesic efficacy of preoperative bilateral erector spinae plane (ESP) blocks in patients having ventral hernia repair. *Anaesthesia* 2017;72:452-60.
3. Adhikary SD, Pruett A, Forero M, Thiruvankatarajan V. Erector spinae plane block as an alternative to epidural analgesia for postoperative analgesia following video-assisted thoracoscopic surgery: A case study and a literature review on the spread of local anaesthetic in the erector spinae plane. *Indian J Anaesth* 2018;62:75-8.
4. El-Boghdadly K, Pawa A. The erector spinae plane block: Plane and simple. *Anaesthesia* 2017;72:427-38.
5. Chin KJ, Karmakar MK, Peng P. Ultrasonography of the adult thoracic and lumbar spine for central neuraxial blockade. *Anaesthesiology* 2011;114:1459-85.
6. Yeung JH, Gates S, Naidu BV, Wilson MJ, Gao Smith F. Paravertebral block versus thoracic epidural for patients undergoing thoracotomy. *Cochrane Database Syst Rev* 2016;2:CD009121.
7. Wahal C, Kumar A, Pyati S. Advances in regional anaesthesia: A review of current practice, newer techniques and outcomes. *Indian J Anaesth* 2018;62:94-102.
8. Garg R, Bhan S, Vig S. Newer regional analgesia interventions (fascial plane blocks) for breast surgeries: Review of literature. *Indian J Anaesth* 2018;62:254-62.
9. Chakraborty A, Khemka R, Datta T. Ultrasound-guided truncal blocks: A new frontier in regional anaesthesia. *Indian J Anaesth* 2016;60:703-11.
10. Jadon A, Jain P, Sinha N. The erector spinae plane block for postoperative analgesia in abdominoplasty – A case report. *BAOJ Anaesth* 2017;1:1-4.
11. Singh S, Chowdhary NK. Erector spinae block an effective block for postoperative analgesia in modified radical mastectomy. *Indian J Anaesth* 2018;62:148-50.
12. Nandhakumar A, Nair A, Bharath VK, Kalingaray S, Ramaswamy BP, Dhatchinamoorthi D. Erector spinae plane block may aid weaning from mechanical ventilation in patients with multiple rib fractures: Case report of two cases. *Indian J Anaesth* 2018;62:139-41.